CLAIMS

1. A method for analyzing a three dimensional region of interest relative to a predetermined event, the method comprising the steps of:

defining a boundary of the event;

defining the region of interest relative to the boundary of the event;

selecting a first attribute and a second attribute, the first attribute and second attribute representing the region of interest;

calculating a first attribute volume and a second attribute volume for the region of interest, the first attribute volume and the second attribute volume each comprising a plurality of voxels, each voxel being defined by a set of x,y,z coordinates and a data value;

selecting a first set of voxels from the first attribute volume that have a data value within a first attribute data value range, the first set of voxels representing a preferred feature of the region of interest;

selecting a second set of voxels from the second attribute volume that have a data value within a second attribute data value range, the second set of voxels representing the preferred feature; and

imaging the first set of voxels and the second set of voxels.

2. The method of Claim 1, wherein the preferred feature substantially comprises gas-bearing sand or sandstone.

3. The method of Claim 2, wherein the first attribute represents an acoustic signal comprising instantaneous amplitude and the second attribute represents an acoustic signal comprising instantaneous frequency.

4. The method of Claim 3, wherein the region of interest is defined as within about 300 feet from the boundary of the event.

5. The method of Claim 3, wherein the first attribute data value range is between about 10 and about 140, and the second attribute data value range is between about 0 and about 48, the first attribute data value range and the second attribute data value range being measured on a voxel scale between about 0 and about 255.

6. The method of Claim 5, wherein the first attribute data value range is between about 37 and about 110, and the second attribute data value range is between about 2 and about 36.

7. The method of claim 5, wherein the first attribute data value range is between about 37 and about 120, and the second attribute data value range is between about 2 and about 36.

8. The method of claim 5, wherein the first attribute data value range is between about 37 and about 130, and the second attribute data value range is between about 3 and about 37.

9. The method of Claim 1, wherein defining the boundary of the event comprises the steps of:

selecting a third attribute, the third attribute representing the event;

calculating a third attribute volume for the event, the third attribute volume comprising a plurality of voxels, each voxel being defined by a set of x,y,z coordinates and a data value;

selecting a third set of voxels from the third attribute volume that have a data value within a third attribute data value range, the third set of voxels representing the boundary of the event; and

imaging the third set of voxels.

10. The method of Claim 9, wherein the event is a geological formation substantially comprising at least dolomite or limestone.

11. The method of Claim 10, wherein the third attribute represents an acoustic signal comprising at least one of amplitude, phase, frequency, instantaneous amplitude, instantaneous phase, instantaneous frequency, coherence and semblance.

12. The method of Claim 11, wherein the third attribute data value range is between at least one of about 50 and about 127 and about –5 and about +5, the third attribute data value range being measured on a voxel scale between at least one of about 0 and about 255 and about –128 and about +127.

13. The method of Claim 12, wherein imaging the third set of voxels comprises the steps of:

selecting a voxel from the third set of voxels, the selected voxel representing a seed voxel;

autopicking voxels from the third set of voxels that are connected to the seed voxel and have the same data value; and

displaying the autopicked voxels from the third set of voxels to a user.

14. The method of Claim 12, wherein imaging the third set of voxels comprises the steps of:

assigning a new data value to each voxel in the third set of voxels, the new data value having the same data value within a new data value range between about 0 and about 127;

selecting a voxel from the third set of voxels, the selected voxel representing a seed voxel;

autopicking voxels from the third set of voxels that are connected to the seed voxel and have the same data value; and

displaying the autopicked voxels from the third set of voxels to a user.

15. The method of claim 1, wherein imaging the first set of voxels and the second set of voxels comprises the steps of:

combining the first set of voxels and the second set of voxels to form a combined set of voxels representing the preferred feature, each voxel in the combined set of voxels being assigned a new data value, the new data value having the same data value within a combined data value range between about 0 and about 127;

selecting a voxel from the combined set of voxels, the selected voxel representing a seed voxel;

autopicking voxels from the combined set of voxels that are connected to the seed voxel and have the same data value; and

displaying the autopicked voxels from the combined set of voxels to a user.

16. The method of claim 1, wherein imaging the first set of voxels and the second set of voxels comprises the steps of:

selecting a voxel from at least one of the first set of voxels and the second set of voxels, the selected voxel representing a seed voxel;

autopicking voxels from the first set of voxels that are connected to the seed voxel and have the same data value;

autopicking voxels from the second set of voxels that are connected to the seed voxel and have the same data value; and

displaying the autopicked voxels from the first set of voxels and the second set of voxels to a user.

17. A system comprising a program storage device readable by a machine, the storage device embodying a program of instructions executable by the machine for analyzing a 3-D region of interest relative to a predetermined event, the instructions comprising the steps of:

defining a boundary of the event;

defining the region of interest relative to the boundary of the event.

selecting a first attribute and a second attribute, the first attribute and second attribute representing the region of interest;

calculating a first attribute volume and a second attribute volume for the region of interest, the first attribute volume and the second attribute volume each comprising a plurality of voxels, each voxel being defined by a set of x,y,z coordinates and a data value;

selecting a first set of voxels from the first attribute volume that have a data value within a first attribute data value range, the first set of voxels representing a preferred feature of the region of interest;

selecting a second set of voxels from the second attribute volume that have a data value within a second attribute data value range, the second set of voxels representing the preferred feature; and

imaging the first set of voxels and the second set of voxels.

18. The system of claim 17, wherein the region of interest is a geological formation and the preferred feature substantially comprises at least sand or sandstone.

19. The system of claim 18, wherein the first attribute represents an acoustic signal comprising instantaneous amplitude and the second attribute represents an acoustic signal comprising instantaneous frequency.

20. The system of claim 19, wherein the region of interest is defined as within about 300 feet from the boundary of the event.

21. The system of claim 19, wherein the first attribute data value range is between about 10 and about 140, and the second attribute data value range is between about 0 and about 48, the first attribute data value range and the second attribute data value range being measured on a voxel scale between about 0 and about 255.

22. The system of claim 21, wherein the first attribute data value range is between about 37 and about 110, and the second attribute data value range is between about 2 and about 36.

23. The system of claim 21, wherein the first attribute data value range is between about 37 and about 120, and the second attribute data value range is between about 2 and about 36.

24. The system of claim 21, wherein the first attribute data value range is between about 37 and about 130, and the second attribute data value range is between about 3 and about 37.

25. The system of claim 17, wherein defining the boundary of the event comprises the steps of:

selecting a third attribute, the third attribute representing the event;

calculating a third attribute volume for the event, the third attribute volume comprising a plurality of voxels, each voxel being defined by a set of x,y,z coordinates and a data value;

selecting a third set of voxels from the third attribute volume that have a data value within a third attribute data value range, the third set of voxels representing the boundary of the event; and

imaging the third set of voxels.

26. The system of claim 25, wherein the event is a geological formation substantially comprising dolomite or limestone.

27. The system of claim 26, wherein the third attribute represents an acoustic signal comprising at least one of amplitude, phase, frequency, instantaneous amplitude, instantaneous phase, instantaneous frequency, coherence and semblance.

28. The system of claim 27, wherein the third attribute data value range is between at least one of about 50 and about 127 and about –5 and about +5, the third attribute data value range being measured on a voxel scale between at least one of about 0 and about 255 and about -128 and about +127.

29. The system of claim 28, wherein imaging the third set of voxels comprises the steps of:

selecting a voxel from the third set of voxels, the selected voxel representing a seed voxel;

autopicking voxels from the third set of voxels that are connected to the seed voxel and have the same data value; and

displaying the autopicked voxels from the third set of voxels to a user.

30. The system of claim 28, wherein imaging the third set of voxels comprises the steps of:

assigning a new data value to each voxel in the third set of voxels, the new data value having the same data value within a new data value range between about 0 and about 127;

selecting a voxel from the third set of voxels, the selected voxel representing a seed voxel;

autopicking voxels from the third set of voxels that are connected to the seed voxel and have the same data value; and

displaying the autopicked voxels from the third set of voxels to a user.

31. The system of claim 17, wherein imaging the first set of voxels and the second set of voxels comprises the steps of:

combining the first set of voxels and the second set of voxels to form a combined set of voxels representing the preferred feature, each voxel in the combined set of voxels being assigned a new data value, the new data value having the same data value within a combined data value range between about 0 and about 127;

selecting a voxel from the combined set of voxels, the selected voxel representing a seed voxel;

autopicking voxels from the combined set of voxels that are connected to the seed voxel and have the same data value; and

displaying the autopicked voxels from the combined set of voxels to a user.

32. The system of claim 17, wherein imaging the first set of voxels and the second set of voxels comprises the steps of:

selecting a voxel from at least one of the first set of voxels and the second set of voxels, the selected voxel representing a seed voxel;

autopicking voxels from the first set of voxels that are connected to the seed voxel and have the same data value;

autopicking voxels from the second set of voxels that are connected to the seed voxel and have the same data value; and

displaying the autopicked voxels from the first set of voxels and the second set of voxels to a user.